

90191



901910



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 1 Science, 2007

90191 Describe aspects of physics

Credits: Five

9.30 am Wednesday 28 November 2007

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–13 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only		Achievement Criteria	
Achievement		Achievement with Merit	Achievement with Excellence
Describe aspects of physics.	<input type="checkbox"/>	Explain aspects of physics.	<input type="checkbox"/>
Overall Level of Performance		<input type="checkbox"/>	

The following may be useful.

$$V_{\text{average}} = \frac{d}{t}$$

$$F = ma$$

$$a = \frac{\text{change in speed}}{\text{change in time}}$$

$$E_p = mgh$$

$$F_{\text{gravity}} = mg$$

$$E_k = \frac{1}{2}mv^2$$

$$\text{Work} = Fd$$

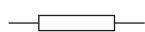
$$P = \frac{E}{t}$$

$$V = IR$$

$$P = IV$$

$$g = 10 \text{ m s}^{-2}$$

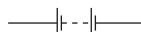
$$g = 10 \text{ N kg}^{-1}$$



resistor



lamp



battery



switch



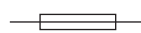
diode



voltmeter



ammeter



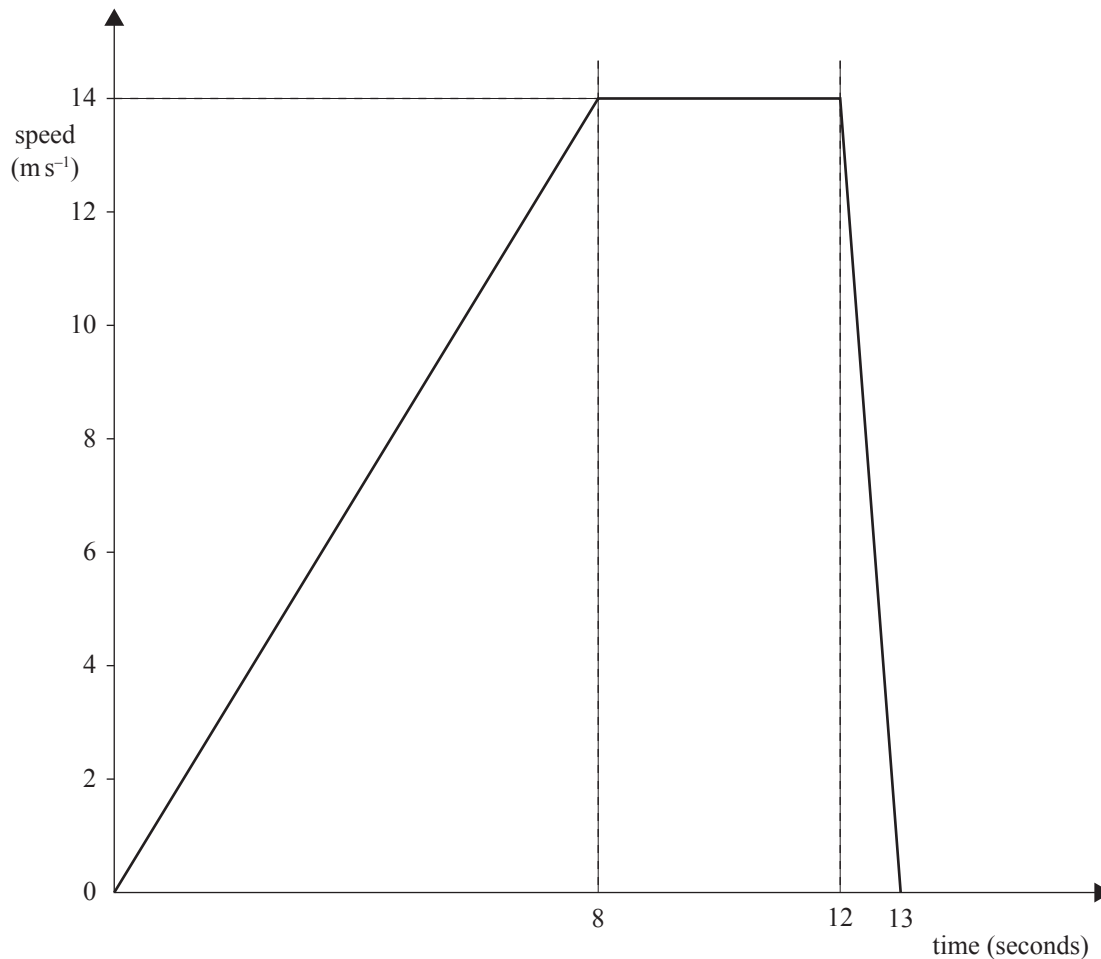
fuse

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You are advised to spend 40 minutes answering the questions in this booklet.

QUESTION ONE: SPORTS TRAINING

The **speed-time** graph below represents sprint training for an athlete.



- (a) State the speed of the athlete at 10 seconds.

_____ m s^{-1}

- (b) Describe the motion of the athlete between 12 and 13 seconds.

- (c) Calculate the acceleration of the athlete during the first 8 seconds.

_____ acceleration = _____ m s^{-2}

- (d) Describe the relationship between the push force and the friction force during the 8 seconds that the athlete is accelerating.

- (e) Using the graph, calculate the total distance travelled by the athlete in the **first 12 seconds**.

_____ distance travelled = _____ m

- (f) When sprinting, the athlete wears sport shoes with spikes like the ones shown below.



Explain how the effect of the **spikes** on the sport shoes **changes** the effect of forces acting on the athlete and how this leads to an improvement in performance.

Another part of the athlete's training is swimming.

- (g) Using the equation $v_{av} = \frac{d}{t}$ calculate the average speed of the athlete during the 90 seconds that the athlete swims **two** lengths (one length = 50 m) of a pool.

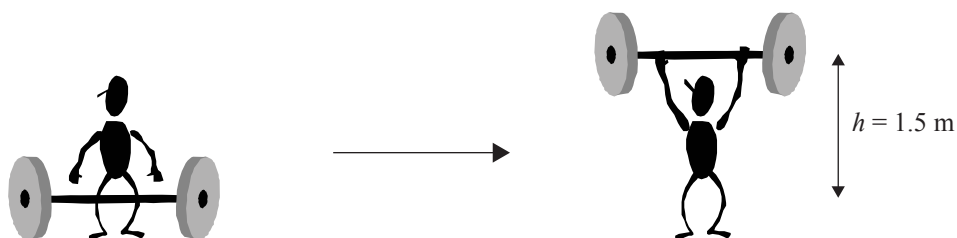
_____ average speed = _____ m s^{-1}

- (h) On the diagram below, **draw** and **label** arrows to show the directions of the following four forces:

gravity, support, push and friction



The final part of the athlete's training involves weight training.



The athlete lifts a 100 kg set of weights above his head, so that the height is changed by 1.5 m.

- (i) Using the formula $F_w = mg$, calculate the weight force of the weights.

_____ Weight = _____ N

- (j) Calculate the work done by the athlete to lift the weights to the new height of 1.5 m above its original position. Give an appropriate unit.

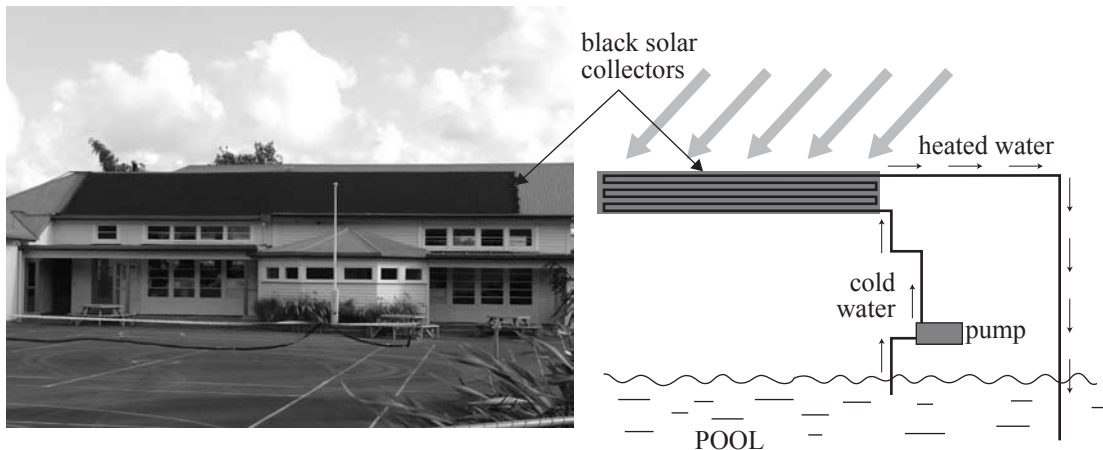
_____ Work = _____ (_____) unit

- (k) Describe the major energy change that occurs when the athlete drops the weights from the new height.

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QUESTION TWO: SOLAR POOL HEATINGAssessor's
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The photo and diagram below show a Solar Pool Heating System



The solar collectors on the Solar Pool Heating System are made from **black** plastic (polypropylene).

- (a) Name the heat transfer process that transfers the Sun's solar energy into the solar collectors.

- (b) Explain why the solar collectors are black.

The heated water is pumped back into the bottom of the pool. After 'some time' the heated water spreads through the whole pool.

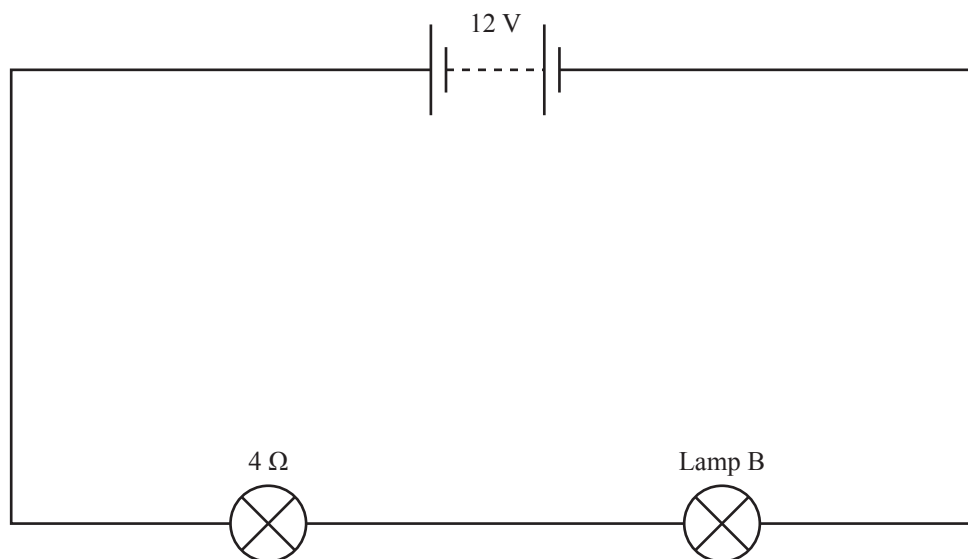
- (c) Name the heat transfer process that causes the heated water to spread through the whole pool.

- (d) Discuss why it is important that the heated water enter at the bottom **rather than** the top of the pool.

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QUESTION THREE: ELECTRICITYAssessor's
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Study the circuit diagram below. The two lamps are **NOT** identical.



When an ammeter is placed in this circuit a reading of 1.2 A is recorded.

- (a) Using the equation $V = IR$, calculate the voltage across the $4\ \Omega$ lamp.

_____ Voltage = _____ V

- (b) Calculate the power output of the $4\ \Omega$ lamp. Give an appropriate unit.

_____ Power = _____ (_____) unit

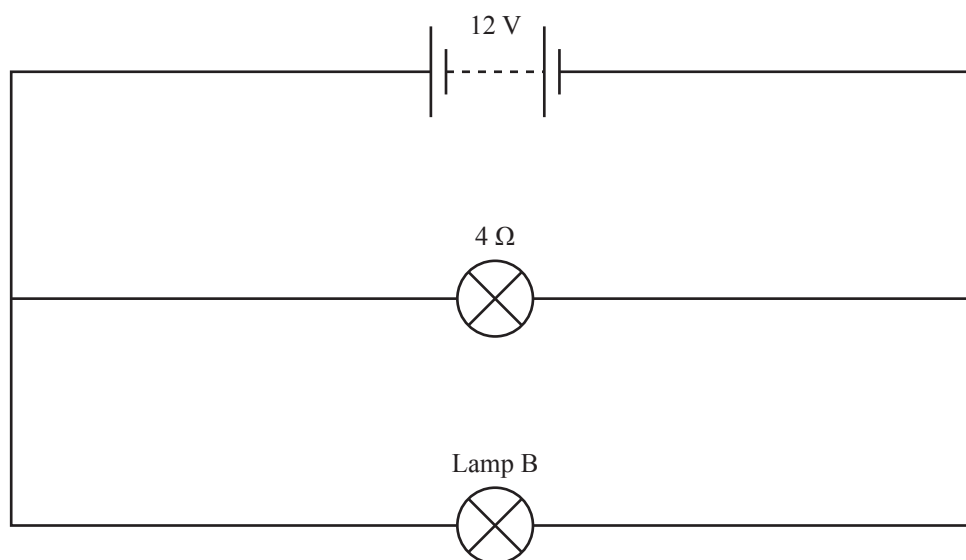
- (c) In terms of energy, explain what the power output in (b) means.

- (d) Calculate the resistance of lamp B.

Resistance = _____ Ω

- (e) Describe how the brightness of lamp B compares with the $4\ \Omega$ lamp.

The circuit is now altered so that the same lamps are in parallel, as shown below.



- (f) On the diagram above, draw an **ammeter** in the correct place to record the **total** current supplied by the power supply.

When this ammeter is placed in the circuit, a reading of 5 A is recorded.

- (g) Explain why the current is larger in the parallel circuit than the series circuit.

**Note that this question
continues on the next page.**

- (h) State which lamp will be brighter, the $4\ \Omega$ or lamp B, and discuss the reasons for this lamp being brighter. You should consider current, resistance and power output.

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**Extra paper for continuation of answers if required.
Clearly number the question.**

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Question
number

[illegible]

